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1991 Miles Lake Sonar Project

Project Operational Plan

By Steve Morstad

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ALASKA DEPARTMENT OF FISH AND GAME
DIVISION OF COMMERCIAL FISHERIES

PROJECT OPERATIONAL PLAN

Title: Miles Lake Sonar Project

Project Leader: Steve Morstad
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Region: Central (R-II)

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APPROVAL

Level	Signature	Date
Project Leader:	_____	_____
Supervisor:	_____	_____
Biometrics:	_____	_____
Regional:	_____	_____
Divisional:	_____	_____

MILES LAKE SONAR PROJECT OPERATIONAL PLAN 1991

LOCATION

The Miles Lake sonar project is located immediately down stream of the "Million Dollar Bridge" on the Copper River, mile 48 of the Copper River highway.

OBJECTIVE

The primary objective of the Miles Lake sonar project is to obtain a precise enumeration of sockeye salmon passing through the commercial gill net fishery to the spawning tributaries of the Copper River drainage. Daily escapement data provides the management staff in Cordova with essential information used in harvest control of the multi million dollar Copper River commercial salmon fishery.

PROJECT PERSONNEL

The project consist of a project leader, a crew leader, and three crew members.

FB-II	Project leader	Slim Morstad	Permanent
FB-I	Crew leader	Tom Vania	5/16 - 8/10
FT-II	Crew member		5/16 - 8/10
FT-II	Crew member	John Richardson	5/16 - 8/10
FT-I	Crew member		5/16 - 6/30

Initial sonar setup requires the deployment of an artificial substrate. With the Copper River currents approaching 15 feet per second, employing artificial substrate tubes is always dangerous. Safety concerns dictate that a minimum of four people is required to employ a substrate tube. As the water rises and the project can utilize the permanent rail substrate, artificial substrate tubes are no longer needed. When this occurs the project requires only a three person crew.

CAMP LOGISTICS

At the start of the project the Copper River highway is closed due to snow. Transportation to the camp is via helicopter service. The United States Coast Guard will provide helicopter transportation on a space available basis. Arrangements for this must be made in advance and will be subject to cancellations due to emergencies. If the Coast Guard helicopter is not available to assist the project, than private helicopter services must be acquired. Once the field camp is established, additional supplies will be sent in via floatplane until the Copper River highway is opened and a vehicle can be used.

CAMP SET-UP

The first chore will be to store equipment as the helicopter brings it in. There will be snow covering the ground so all electronics must be quickly stored to prevent damage. Electronics and equipment should be separated so deliveries can be made to the north and south bank shacks. Special consideration should be given to what will be delivered first. Food, stoves, fuel, single side band radio, batteries and personal gear should be given priority.

Several duties can be preformed while the helicopter is in route to pick up more gear. It is the responsibility of the crew leader to assign duties and make sure the following gets accomplished as soon as possible:

1) Raise the radio antenna and hook up the single side band radio.

2) Install batteries and solar panels in the cookshack and the bunkhouse.

3) Hook up the heating stoves and fuel drums in the cookshack and bunkhouse.

4) Hook up propane tanks to refrigerator and range.

5) Hook up rain gutter and water system.

6) Sweep and clean the cookshack.

7) Store food items on shelves.

As these priority duties get accomplished attention can be paid to cleaning the bunkhouse, shoveling pathways in camp, clearing off south bank permanent rail substrate, and putting the boat in the water. The boat is stored on the north bank under the "Million Dollar Bridge". The outboard motors should be delivered to the north bank shack by the helicopter.

SONAR INSTALLATION

Sonar counting units are deployed on both the north and south banks. Each bank utilizes a 1985 model Bendix side scan sonar counter with programmable sectors. The project has two 1978 model counters to use as spares. The programmable sectors should be set to conform with the previous year's program and is as follows:

1) South Bank

Sectors	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Criteria	3	3	3	4	5	5	6	6	3	3	3	4	5	5	6	6

2) North Bank

Sectors	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Criteria - 3 3 3 4 5 5 6 6 3 3 3 4 5 5 6 6

Initially the fish velocity should be set to the previous year's velocity as indicated on the printer tape. Changes may be made to this setting as needed. Printers are stored with a rubber band holding down the pressure release lever and must be removed prior to operation.

A 40 foot artificial substrate is used on the south bank during periods of low water. When the water level reaches 134.00 (as indicated by the hydrologist water gauge) the south bank transducer can be mounted on the permanent rail substrate. A mechanical rotator assembly mounted on a tripod is used on the North Bank. After the south bank is operational the north bank should be set up. Priority is given to the south bank due to the high rate of fish passage on that side.

SONAR DATA RECORDING

Data records are kept in two notebooks, one for each bank. Notebooks should contain daily count sheets, calibration logs, adjustment logs, and hourly printouts. It is the crew leader's responsibility to maintain the organization and accuracy of these books, however all crew members are expected to be thoroughly familiar with the notebooks and contribute equally to the entry and compilation of data and field notes.

SONAR DATA SHEETS

Hourly sonar counts by sector are to be translated from the taped print out from the counter and written on the corresponding data form (Figure 1.) It is essential that all data be recorded neatly and all arithmetic operations be preformed to a high degree of accuracy.

COUNTER MONITORING

Instructing someone how to monitor (calibrate) is best done when fish are passing in fair numbers, and is probably the most nebulous part of the operation. Confidence that you are monitoring correctly is mainly a function of experience, consistency and learning as much as you can about the behavior of fish in the system. Monitoring information is recorded on Figure 1.

Following are some terms, definitions and fish counting criteria which seem to work reasonably well. Please keep in mind what you have learned about hydroacoustic principles and use the criteria as a general rule.

Terminology

Valid Count: Counter enumerates each target one for one. Each spike should reach an amplitude of between 3 and 6 volts (1/2 to equal to transmit spike height).

Pulse repetion rate should be set so fish passage rate allows sufficient returning echoes (hits) to count as a single target. Both characteristics (spike amplitude and duration) will probably be unique for your situation. Variation in these characteristics can be extreme between sites, and each day throughout the season.

Subthreshold: Target which does not meet the above amplitude criteria. It can be caused by fish over or undershooting the beam, or may be related to aspect, near field effects.

Undercount: Target which meets the amplitude criteria but does not count.

Overcount: Target which meets the criteria and counts more than once. It is important to distinguish between an overcount, two fish side by side or two fish nose to tail. The counting resolution is approximately 6" center to center (minimum distance between target centers). You are looking at a 4" representation of 60 ft and two spikes can easily look like one. Try expanding the sweep (magnifying the picture horizontally) if you suspect this is happening.

Debris: Generally the holding time (time in the beam) of debris drifting downstream is very short relative to fish moving upstream. Ice burgs from the Calving of Miles Glacier will remain in the beam long enough to rack up counts. During periods of heavy calving the machine must be monitored.

PROCEDURES

The objective of monitoring is to make sure that the counter counts approximately the same number of fish as the oscilloscope observer. If comparative counts (oscilloscope and counter) are not within 20% then the counter must be adjusted. There are several counter adjustments available to reach this objective:

1) pulse repetion rate: called fish swimming speed on the counter face. Adjustments of the fish wheel changes the ping rate of the counter. As the number approaches 1, the ping rate decreases. Appendix A offers a simple explanation of how to calculate correct swimming speed based on monitoring results. However, since the relationship between the fish speed dial and pulse repetion is not exactly a linear relationship, the calculated fish speed provides only a starting point for further monitoring.

2) power adjustment: The small screw pod on the face of the counter adjusts the amount of power sent to the water by the sounder. This is measurable in volts on the oscilloscope. To low of a setting the echo are not meeting the criteria for a count which is a subthreshold, to high of a setting creates a noisy environment and counts occur. Counters modified for long range counting may have 240 volt upper limit. Check the manual specific to each counter. If possible, the power setting should remain constant.

3) adjustable hit criteria: Counters modified for long range, substrateless applications allow adjustment of the hit criteria (number of returning echoes necessary for a target to be counted as a fish) within each sector. These adjustments are made via wheels on the front of the counter, or piano switches

on the inside of the front panel. Hit criteria are set in the same manner as the pulse repetion rate; ie. monitor individual sectors and compare the oscilloscope count to the counter. Changes should be recorded on the appropriate form xx.

CALIBRATION SCHEDULES

South bank sonar counter will be calibrated every two hours and the north bank once every 4 hours. Adjusting the pulse rate when required to remain within + or - 20% . When readjustment of the pulse rate is required than a recalibration will occur until the calibration is within the desired level.

Calibration periods will be for 15 minutes or 100 fish, which ever comes first. The north bank rarely estimates 100 fish in an hour, therefore calibrations can be expected to run the entire time.

Calibration data is recorded on the calibration log sheet immediately following each calibration period. The tape will be removed from the counter once a day after the print out at 00:00(midnight). (Each hourly print out will be labeled with that hours time). The person on duty should write on the tape removed: date, counting time duration, pulse rate, counting range, dead range, bank location, and their initials. This tape is to be taken back to the field camp and recorded on the sonar data sheet. The tape remaining on the counting unit should be labeled with the time of the next printout.

CALIBRATION LOG

Calibration data is recorded on a log sheet (Figure 2.) kept in the north and south bank shacks. When a log sheet is filled, it is transferred to camp and placed in the appropriate notebook. The calibration factor (Q) is calculated as follows:

$$Q = \frac{\text{scope count}}{\text{sonar count}}$$

The following is recorded on the log sheet:

1) date
2) observer
3) start time
4) stop time
5) scope count
6) sonar count
7) percent agreement or
8) "calibration factor"
9) old fish velocity
10) new fish velocity
11) Sensitivity
12) Comments

Sensitivity should be checked twice a day. The procedure for determining the sensitivity (volts) is outlined in the **Installation and Operation Manual Side Scan Salmon Counter Report No. SP-78-017.** The comment field should be used to note water and weather conditions, ice debris, change in fish velocity, and anything that may affect the calibration.

WATER LEVEL

Water level is measured twice daily following the 7:00 am and the 7:00 pm calibrations. The water level is read from a gauge located in the hydrologist shack adjacent to the south bank shack. Water levels are recorded on the calibration log sheet and the radio log sheet.

ADJUSTMENTS TO SONAR DATA

It is periodically necessary to make estimations for missing hourly counts resulting from the counters being temporally out of commission from a variety of reasons. All adjustments will be footnoted and explained on the data sheets. The following adjustment conventions will be used:

1) Debris Counts - The Bendix salmon counters flag continual repetitive counts in a given sector as debris counts, indicated by a "+" in a column left of the sector number on the print out tape. Debris counts are ignored and the corresponding sector count is estimated by linear interpolation from the two hours preceding and two hours following the hour the debris occurred (Figure 3). Debris counts are designated by an asterisk on the sonar data sheet, and footnoted at the bottom. The observer must be a wear that just because the counter indicates an hourly count with a "+" as debris it doesn't mean that count should be interpolated. If fish passage at any given time within that hour is greater than 33 fish per minute the debris "+" indicator will be printed. The observer must be sure the "+" represents debris and not fish before any interpolation of counts is done.

2) Missing Sectors or Blocks Of Time - Hourly data for missing sectors (skipped by printer) or missing blocks of time one hour or greater (resulting from iceberg damage or change of substrate) are estimated using a linear interpolation similar to debris counts, using the following formula:

Hours of Data Missing	Interpolation Range
1	2 hrs. before to 2 hrs. after
2	3 hrs. before to 3 hrs. after
3	4 hrs. before to 4 hrs. after
4 or greater	5 hrs. before to 5 hrs. after

3) Partial Hour Counts - When a counter operates for only a portion of an hour, the total hour count is estimated by a proportional expansion (Figure 4.). For example a 45 minute count of 30 would be expanded by a factor of 60/45 to a count of 40. Partial counts less than 15 minutes are ignored and the hourly count is interpolated as in (2.) above.

ADJUSTMENT LOG

All adjustments to the sonar electronics and equipment are noted on the sonar adjustment log forms (Figure 5.). This includes such things as, changes to the counting range and dead range, moving the transducer, ice or logs knocking the equipment out of service, reaming the transducer, turning data off, etc.

RADIO SCHEDULE

A radio schedule is maintained with the Cordova office each morning. On the 3230 frequency, Cordova maintains a schedule from 9:30 am to 10:00 am. In the past it has been found that this schedule is too late for the information to be relative to early morning management decisions. Therefore, the 5195 frequency may be used as an alternative and scheduled between 8:00 am and 8:30 am. The following information is to be transferred:

1) Previous day's count for the south bank
2) Previous day's count for the north bank
3) Total count for the previous day
4) Cumulative total count to date
5) 7 hour morning count for both banks
6) Estimated 24 hour count for the day
7) The 7:00 am water level

Call letters for 3230:

WQF457	Miles Lake
WON30	Cordova

Call letters for 5195:

WGT745	Miles Lake
WON30	Cordova

DAILY CAMP OPERATIONS

In addition to the daily calibration schedule and maintaining the sonar equipment, there are daily activities which should be incorporated into the routine.

Miles Lake is a popular recreation area for the local community and the sonar field camp is easily accessible to the public. Therefore a special attention must be paid to keeping the camp clean and presentable.

Garbage will be separated, burnables from non-burnable. Non-burnable will be compressed, bagged in garbage sacks and sent to town. Burnable will be burned regularly in a designated area. This area will be periodically cleaned of remaining debris.

A regular meal schedule will be maintained with each person doing his or her share of the work, preferably on a rotating basis. The K.P. duties should be handled in the same manner.

Keep a list of supplies needed so it will be available when someone drives to town for supplies. Miles Lake is considered a remote field camp so trips to town should be limited to once a week.

The boat should be check daily to bail out any water that has accumulated and to move it to a new tie down if needed.

CAMP BREAKDOWN

At the end of the season all equipment must be brought into town and be stored in the Miles Lake bin. As the project nears completion, items no longer needed should be brought into town while making a grocery run. All items are to be checked off the inventory list as they are stored. All items should be clean, labeled, and stacked neatly in the bin.

Appendix 1.

Adjusting Fishspeed

Fish Speeds and Dial Reciprocals

1.00 ft/sec =	1.000 sec/ft
1.75 ft/sec =	.571 sec/ft
2.00 ft/sec =	.500 sec/ft
3.00 ft/sec =	.333 sec/ft
4.00 ft/sec =	.250 sec/ft

Fish Overcounting

Problem: Fish in beam too long; pulse repetition rate too high

Solution: Decrease pulse repetition rate - dial fish speed down

Fish Undercounting

Problem: Fish not in beam long enough; pulse repetion rate too slow

Solution: Increase pulse repetion rate - dial fish speed down

Calculation of Degree of Change in Fish Speed Dial

Step 1. Calibrate

Step 2. Divide side scan count by scope count = Q
(If Q is within .8 to 1.2, do not adjust)

Step 3. Multiply existing fish speed by number generated in Step 2 (Q) to obtain the new fish speed

Examples:

Scope Count	Sonar Count	Sonar Count Q= Scope Count	(existing) (fish speed * Q	New fish Speed
15	20	1.33	(.571) * 1.33	.761
20	15	.75	(.571) * .75	.428

Remember! This will only give you a "ball park" estimate. You will have to fine tune the speed for your particular condition.